Exit Presentation

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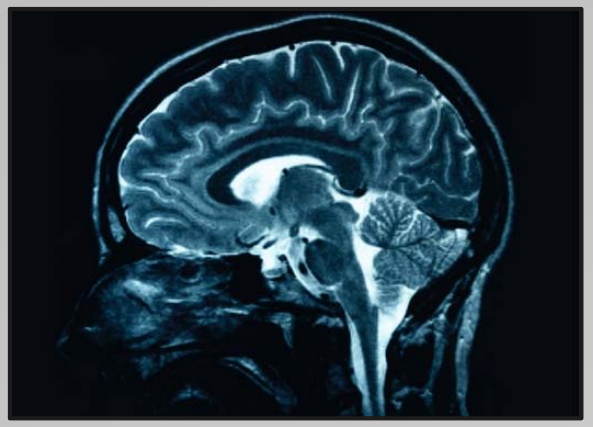
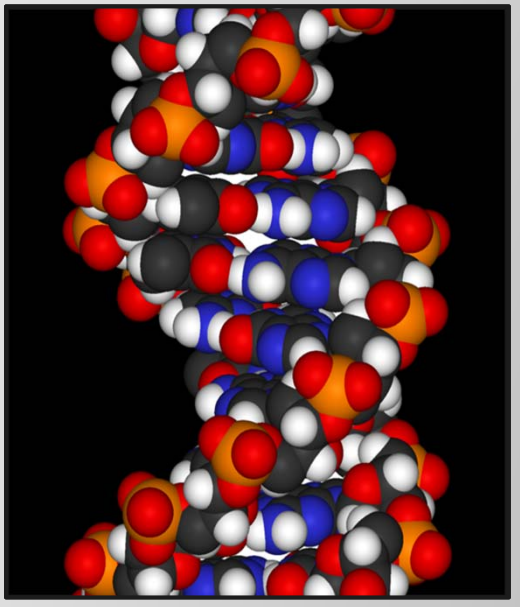
Immunology

SPACE LIFE SCIENCES
SUMMER INSTITUTE

About Me





JOHNS HOPKINS MEDICINE ?

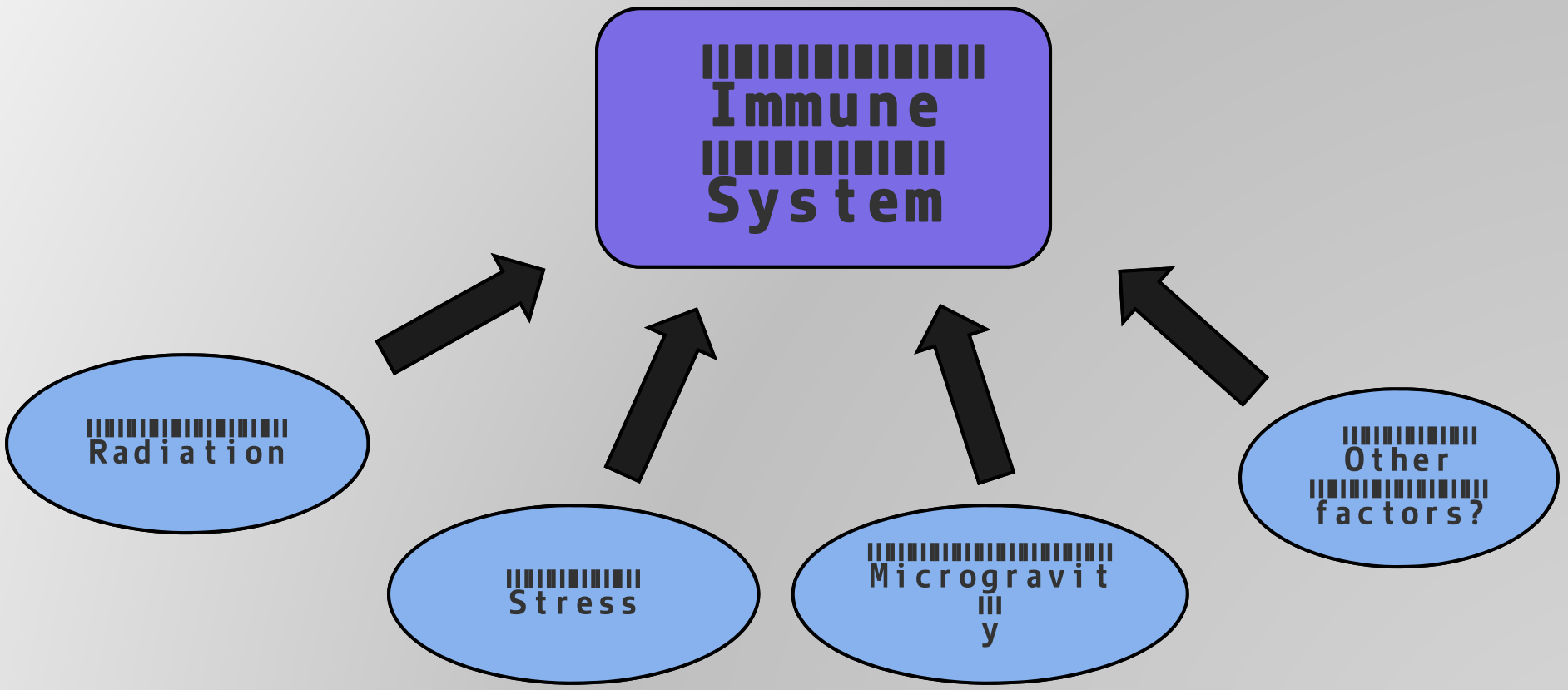
Objectives of Internship

- Gain experience with lab techniques
- Review the literature
- Research the effects of spaceflight on the immune system
- Assist with other projects as needed

Immune Function during Spaceflight

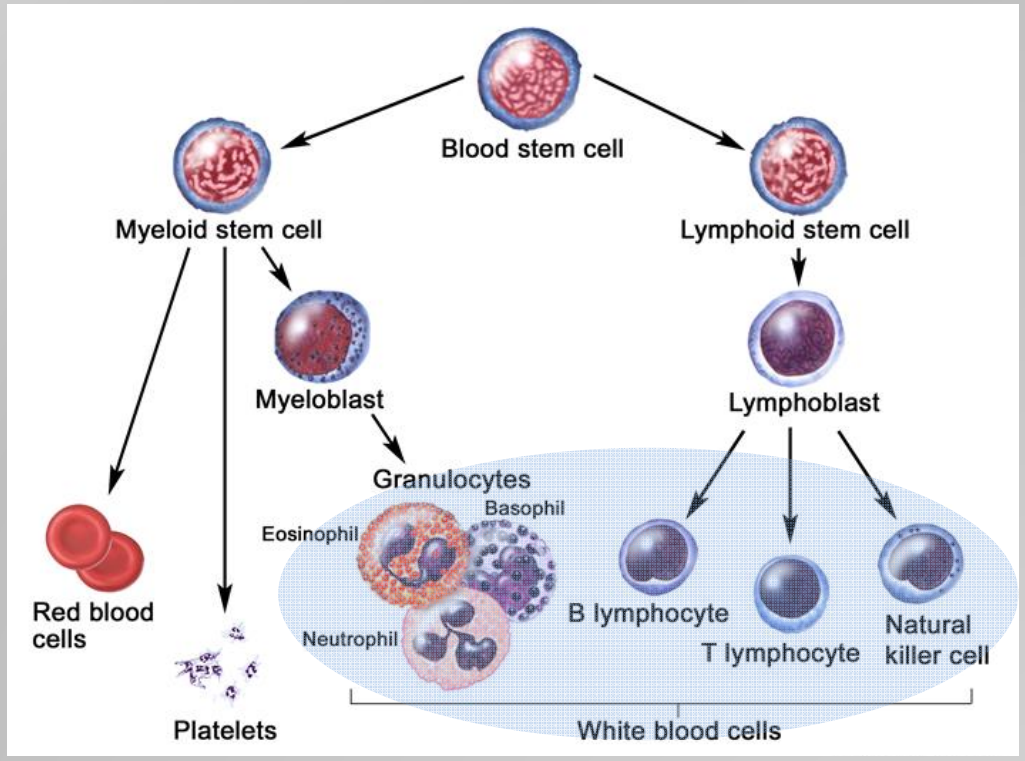
- What's been found:
  - Latent virus reactivation
  - Illness on orbit
  - Hypersensitivity
- Long-duration missions
  - No medical center
  - No evac to Earth

Immune Function during Spaceflight



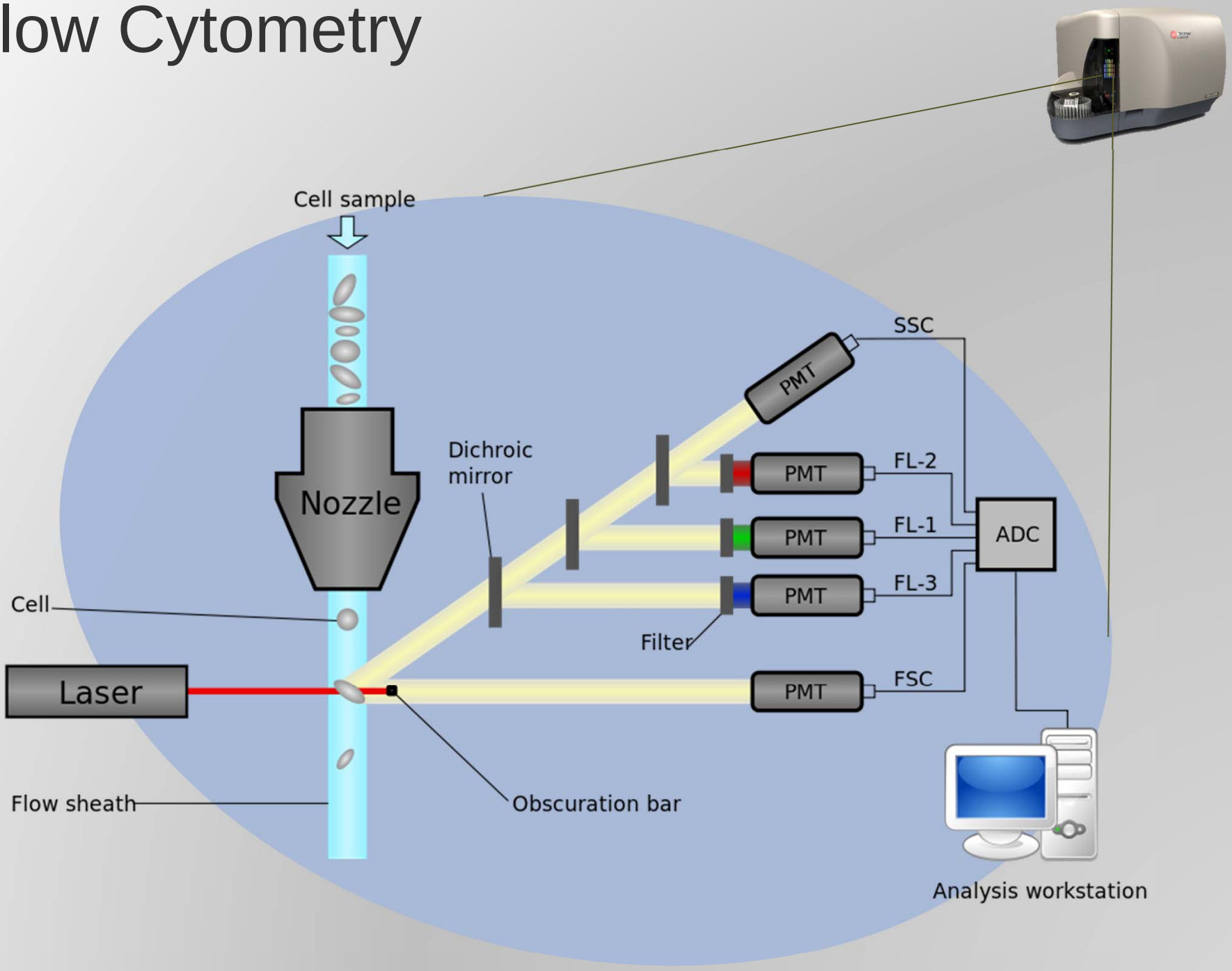
Background

- We can measure:
  - Number of white blood cells
    - Absolute count
    - Distribution among subtypes
  - Function of white blood cells
    - T-cell activation
    - Cytokine production

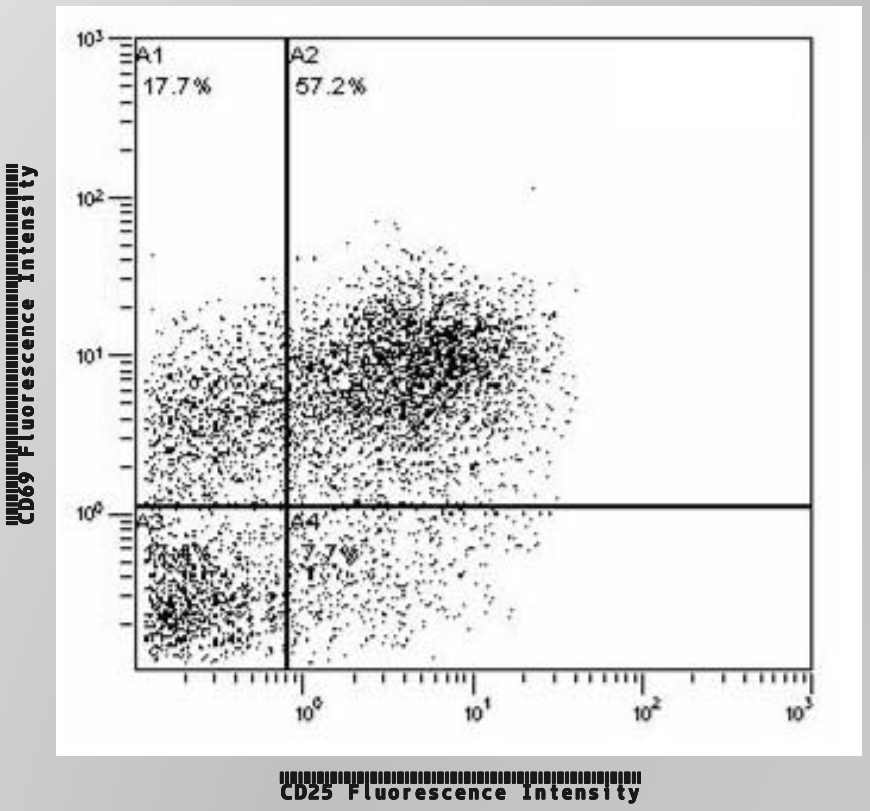


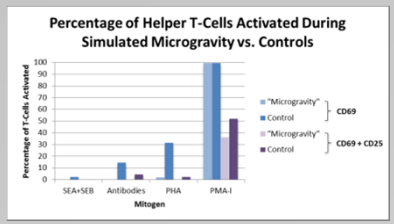
KEEP CALM AND DO FLOW CYTOMETRY

Flow Cytometry



Flow Cytometry





Flow Cytometry

Excitation	488						633
Emission	530	575	615	682	695	785	660
	FITC	PE	ECD	PC5	PC5.5	PC7	APC
	FL1	**FL2**	**FL3**	**FL4**		**FL5**	**FL6**
14-19-45	CD14	CD19		CD45			
3-56-45	CD3	CD56		CD45			
4-8-3	CD4	CD8		CD3			
RA-RO	CD45RA	CD45RO	CD8	CD3			
DR-69	HLA-DR	CD69	CD8	CD3			
C1.7	CD8	CD28		CD244		CD3	
62L	CD62L		CD45RA	CD8		CD3	

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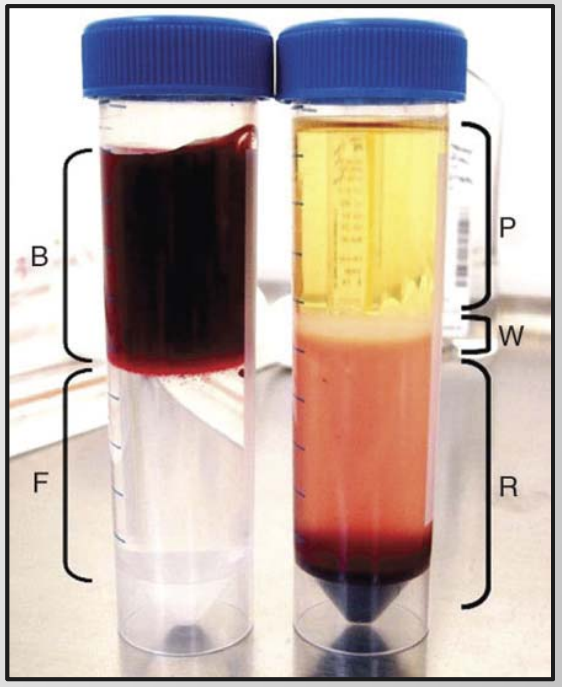
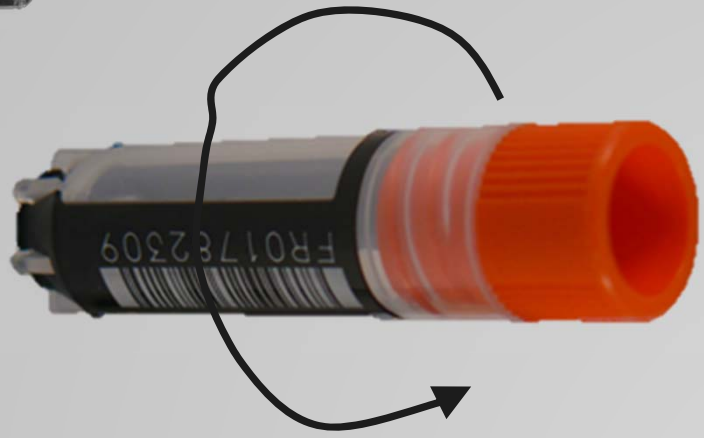
	FITC	PE	ECD	PC5	PC5.5	PC7	APC
	FL1	**FL2**	**FL3**	**FL4**		**FL5**	**FL6**
T/B/Mono	CD45	CD19			CD3	CD14	
Cytotoxic Effector	HLA-DR	CD244			CD3	CD28	CD8
B Cell subsets	IgD	CD19		CD27			
Dendritic Cells	MHC-II	CD123			CD19	CD14	CD11c
Viral-Specific	CD8	EBV-BMLF			CD3		CMV pp65
Treg	CD25	FOX-P2			CD3		CD4

Other Techniques

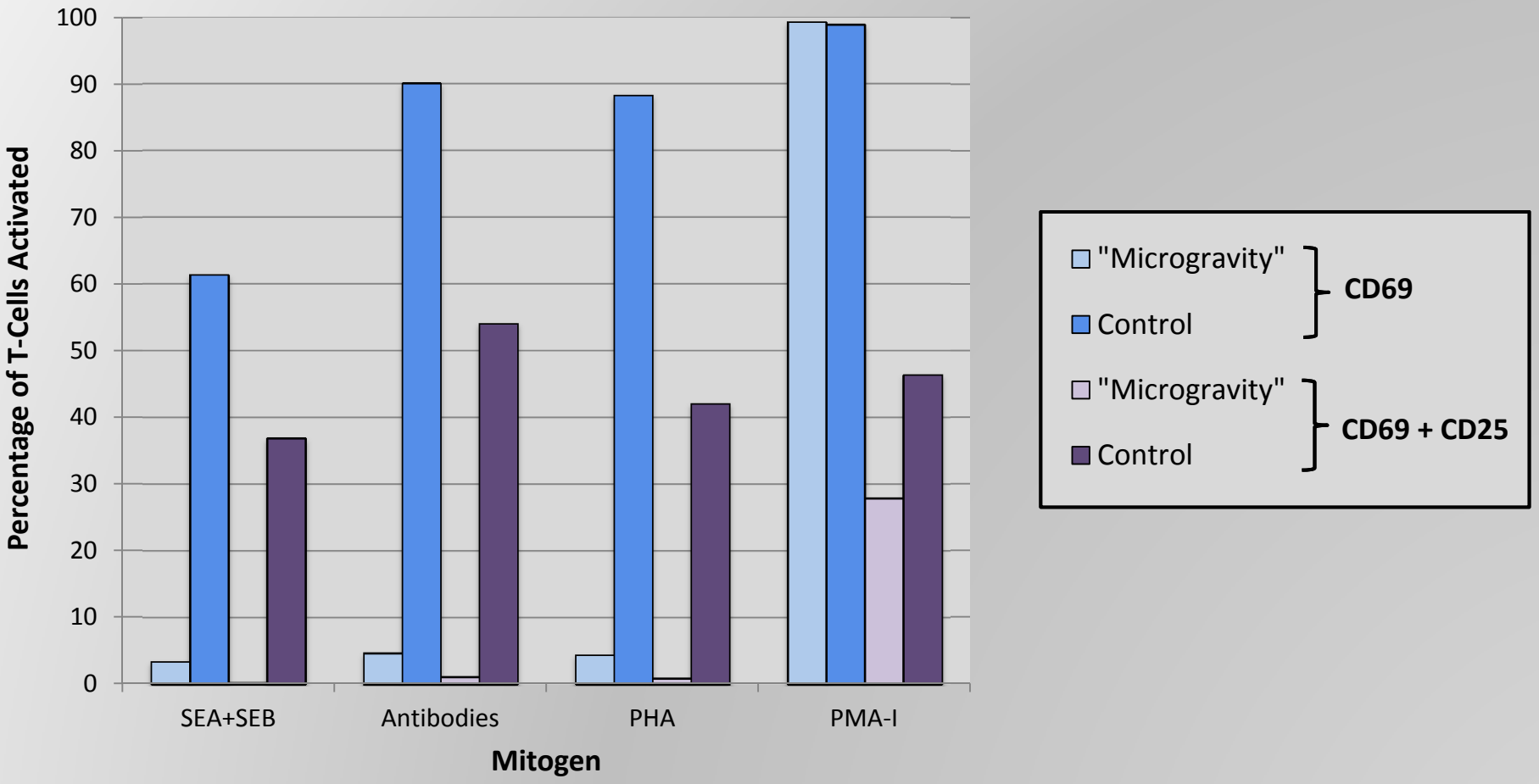




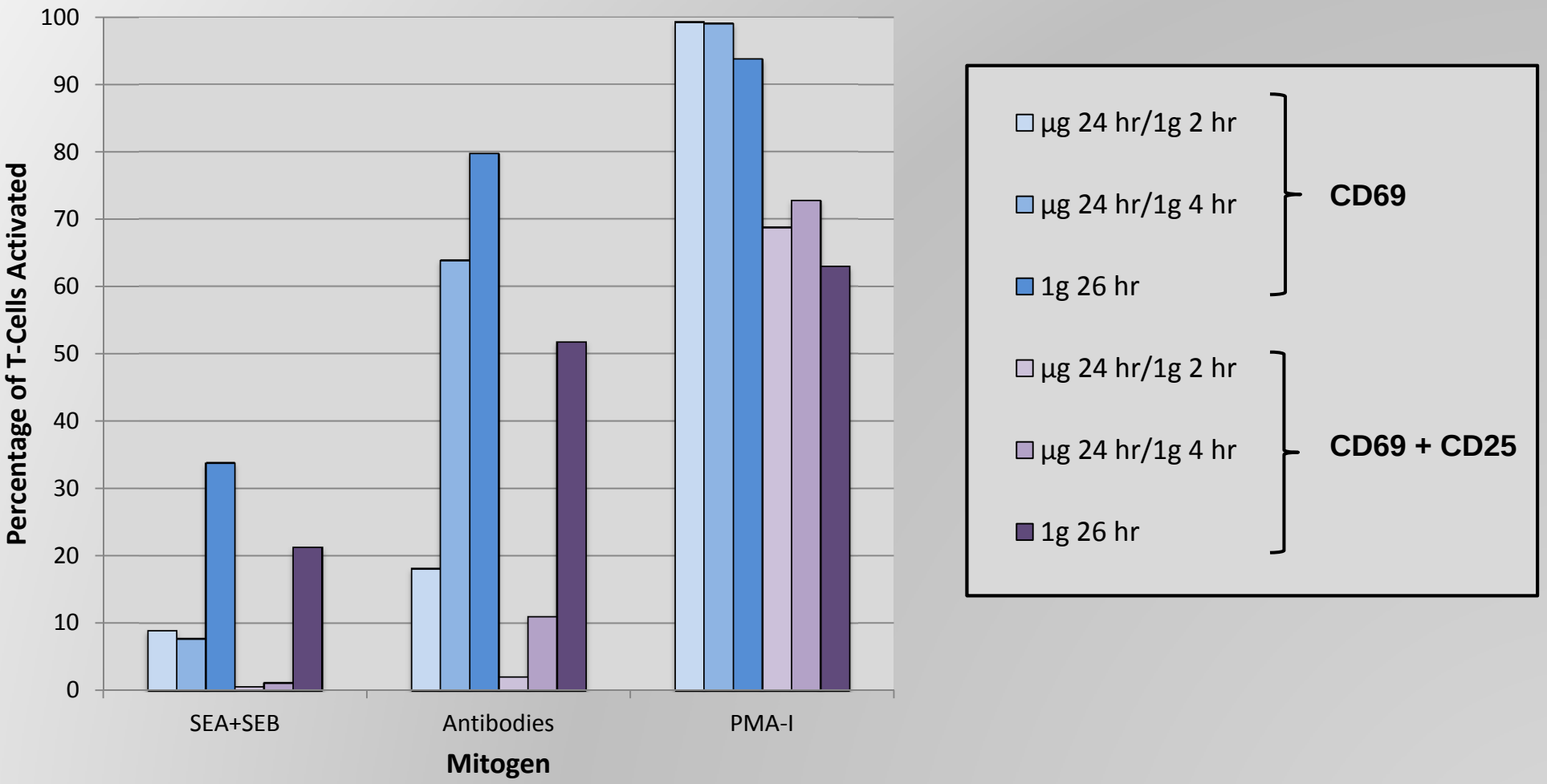
T-cell Activation Experiment

- Culture T-cells in clinostats and compare their ability to respond to different activation signals with that of static controls
  - Activation defined by higher levels of cell surface markers CD69 and CD25

Percentage of Helper T-Cells Activated During Simulated Microgravity vs. Controls



Recovery of Activation in Helper T-Cells After Culture in Modeled Microgravity



Experimental Results

- Confirmed previous findings
  - Modeled microgravity inhibits T-cell activation
  - Activation defect occurs at cell membrane
- Acquired new data
  - Time-dependent restoration of T-cell activation after return to gravity

A Very Productive Internship

- Learned and practiced lab techniques
- Read the primary literature in my field
- Learned basics of VBA and wrote script to facilitate colleague’s work
- Shadowed in Microbiology Lab

Acknowledgements

Special thanks to:

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Dr. Mark Ott

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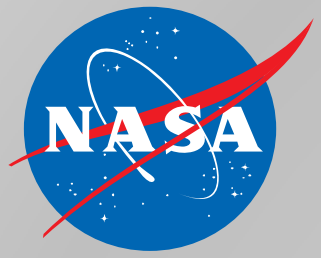
NASA